NPIC/TSSG/RED-1869-69
15 October 1969

MEMORANDUM FOR THE RECORD

SUBJECT : Photo Polymerization and the Free Radical Process

REFERENCE: Based on Information Provided by the Exploratory Laboratory, TSSG/RED/ATB

1. Polymerization is the process by which monomers (small organic molecules) are converted into polymers (large organic molecules formed by the linking together of many monomers). The properties of these polymers, which consist of complex straight and branched chains of monomers, may be considerably different than those of the monomers of which they are formed.

2. Photopolymerization is the process by which monomers are converted directly or indirectly into polymers by radiant energy. The free radical process apparently employs a dormant chemical activator (carbon tetrabromide or a similar compound) which is activated in turn by incident light. This chemical activator serves to polymerize adjacent dye molecules which may result in a visible color. As in this case, it is often characteristic of polymerizations that a small quantity of activator converts a relatively large mass of monomer to polymer--thereby producing an amplification effect somewhat analogous to that of silver halide photo processing.

3. The potential benefits of such a photographic system are the amplification effect which may result in increased speed and sensitivity and the high resolution potential of its molecular character.

4. The problems experienced to date have been in lack of control and repeatability of the process. It sometimes starts before intended initiation and does not stop with the arresting energy (generally heat and/or heat). This control is apparently a very sensitive and complex process. It is not necessarily impossible, but it gets to be consistently demonstrated to our knowledge.

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